OUR EYES

AND HOW TO TAKE CARE OF THEM

H. W. Williams

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OUR EYES,

AND

HOW TO TAKE CARE OF THEM.

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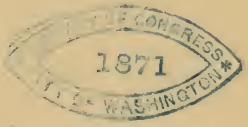

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PREFACE.

THE Author's purpose in preparing these papers, first published in "The Atlantic Monthly," was to explain to parents, teachers, and all who have occasion to use their eyes, in the simplest language possible, some of the advances which have been recently made in our knowledge of the eye, its powers, and its proper uses; and to show what should be done and what avoided, that the sight, the most important of our senses, may be enjoyed and preserved.

Furthermore, he has endeavored to point out some of the dangers to which the eye is exposed, in the hope that those arising from disease may thus be lessened, and those due to ignorance and neglect averted.

15 Arlington Street, Boston,
April, 1871.

OUR EYES, AND HOW TO TAKE CARE OF THEM.

THE form of the eye, its structure, and its powers, call forth fresh admiration as they successively claim our attention. Its form affords the greatest resistance to external violence, and is most perfectly adapted for the fulfilment of the function of vision, as it allows of the continued exercise of its powers during the act of turning the eye, which could have been accomplished in no other way. Had its shape been different, it would have been less strong, unless made up of heavier materials; and its glance could not, as now, have strayed at will "from heaven to earth, from earth to heaven," reading, near and far, the ever-present lessons of light and beauty.

Even bone would have been a less perfect protection for the delicate internal parts than is the light tissue which forms the framework of the globe, — so yielding in its elasticity, yet so firm in its tough resistance. In front, we find the strong white membrane, the sclera, modified to a transparent structure, the cornea, an equal safeguard against intruding enemies, and giving unimpeded entrance to light alone.

The nerves and blood-vessels, which, if placed in it, would have weakened the fibrous envelope, are included in another interior membrane, the choroid; and within these is spread out the delicate nervous perceptive tissue, the retina, to which all the other parts are auxiliary and subservient. Upon this images of all visible Nature are pictured: from it the fleeting impressions are telegraphed to the brain, and we are conscious that we *see*.

But, to this function of seeing, other conditions are essential. The eyeball, the most

perfect of optical instruments, must have its focal powers completed by the presence of refracting substances, the aqueous and vitreous humors and crystalline lens, which at the same time give form to the globe, and by their quiet pressure keep the nervous tissue expanded, and in readiness for its appropriate work. By a combination of these refracting agents, the rays emanating from objects are transmitted and concentrated so as to render the image upon the retina distinct and well defined.

Furthermore, the passage of rays through these transparent media is regulated by a curtain, the iris, of which the circular opening, the pupil, expands and contracts according to the amount of light; the movements of the curtain being self-impelled, without any effort of the will. Thus, contracting in a strong light, it protects the retina from being injured by the glare; and, expanding where the light is dim, it allows a larger number of rays to enter, so as to form a clear image. Like the

choroid, this curtain is lined with dark coloring-matter, not only to absorb any irregularly refracted rays, and prevent reflections from side to side within the globe, but to exclude the entrance of light through the coats of the eye, except in the direction most suitable for refraction, — through the cornea and pupil.

To complete the noble endowment of capacities, the eye has yet another power. It is a self-regulating optical instrument. We may turn our eyes from the printed page to gaze at a distance, or withdraw them from space to fix them upon a minute atom; and the eye adapts itself instantly to each of these uses. By means of a circle of delicate fibres, so small that till lately their existence and uses were unknown, — the ciliary muscle, — the convexity of the crystalline lens can be increased, and its focal power varied; and thus, without conscious effort, the eye may contemplate the glories of the firmament, or catch the first flitting expression of an infant's love, or explore the mysteries of microscopic existences.

Finally, we have *two* eyes; not merely that we may be doubly provided against the danger of accidental loss of the inestimable privileges of vision, but to enable us to estimate the size, form, and distance of objects with more correctness than we could with one eye alone. To a single eye, every thing would have appeared as a plane surface; and it would have been difficult to determine whether objects had solid or only superficial dimensions, or whether they were near or far. With two eyes, the impressions made on each mutually correct one another, and combine to convey to the brain perceptions of the properties of things which could otherwise have been gained by the touch alone.

HOW TO USE THE EYES.

Every normal eye is capable of a great variety and amount of use. It sees near or far with the same ease and with equal clearness. But these powers, extensive as they are, may be overtasked. Because the eyes

can see minute objects without difficulty, it does not follow that they should be kept almost constantly looking at small objects. They were intended for varying use; and, like any other organ of the body, they may be enfeebled or injured by having their most delicate powers continually and exclusively employed in one manner.

One of the first rules laid down by a teacher to his pupils should be, *not* to keep their eyes fixed upon their books. Apart from the probable injury to the eye itself by too close application, I am satisfied that lessons, especially those requiring thought, cannot be as well committed to memory when the eyes are fixed upon the page as if they are permitted to wander. The eyes must, of course, look at the book often and long enough to take in the idea; but, if they are too steadily kept there, the perceptive power seems to occupy itself with the visible objects to an extent which is unfavorable to other mental processes. A distinguished engraver

once said to me, "I know now how to make a face think;" and he explained that the secret lay in giving a certain expression to the eyes by causing their axes to have a very slight divergence from each other. This corresponds with my observation; and this *position of thought* is exactly the opposite of that assumed by the eyes when looking at a book.

For the sake of even normal eyes, it would be most desirable that education should be simplified; that children should not be required to learn an infinity of details which they are sure to forget, and which could be of no possible use to them if retained; that they should be taught to think as well as to remember, — and, in fact, as a means of remembering, — instead of giving all their time in school, and often out of school, and by artificial light, to acquiring a parrot-like facility of repeating lessons which they do not comprehend. It might require more pains, but it would certainly be a great advantage, if teachers would *teach* children what they know,

rather than content themselves with being mere hearers of lessons which may have been learned by the eye, but often not by the understanding.

It would scarcely seem to be necessary to say a word of warning in regard to imprudent testing of the power of the eyes; but instances are not rare where children or adults have done their eyes serious harm by trying to look at the sun, or by observing an eclipse without using a smoked glass. The direct solar light and heat seems, in these cases, to destroy the perceptive power in a greater or less portion of the retina. Injury may also result from using the eyes for looking at small objects by moonlight, which does not give sufficient illumination for such purposes.

SOME POPULAR ERRORS.

There comes a time when normal eyes find their powers grown limited, and require more light, or assistance from glasses, when looking at small near objects. When this period

arrives, it is an error to persist in endeavors to do as formerly with the eyes; but much use must be avoided, except in a clear light or with the required auxiliaries. It is also a mistake, as will hereafter be shown, to suppose that glasses should not be worn while it is possible to avoid doing so: on the contrary, they serve to prevent straining of the eyes, and preserve rather than injure vision.

Certain defects of refractive power are due to maleformation of the eye, either existing from birth or acquired afterwards, and are not to be removed by remedies or by manipulation. It is a mischievous error to suppose that the form of an elastic globe, filled with fluid or semi-fluid substances, can be changed, except for the moment, by pressing upon it with the fingers, as has been recommended by charlatans. All the theories, that the eye can have its form favorably modified by rubbing it always in one direction, or by any other manipulation, have no foundation in facts. But while persistent squeezing, ac-

cording to these methods, can never do any permanent good, it involves great risks. It may lead to congestion and hemorrhage within the eyes; or give rise to destructive inflammation or the formation of cataract by dislocating the crystalline lens; or cause almost immediate loss of sight by separation of the retina from its neighboring parts; or may increase the giving way of the back part of the globe, which is already often begun in near-sighted eyes.

The same warnings will apply with equal force against the use of the eye-cups fitted with rubber bulbs, to alter the form of the eyeball, as is asserted, by suction. Valueless and dangerous as they are, persons are often persuaded to purchase and try them, — sometimes to their sorrow.

VARIATIONS FROM THE NORMAL STANDARD OF SIGHT.

Every eye ought to see distant objects clearly. If it cannot do so, its refractive

power is at fault, or it is the subject of disease. The eye ought also to have clear perception of small objects, such as print, &c., when held at a proper distance. If it has not, the fault may lie in either the refractive power or the accommodative function; or there may be disease of some of its parts.

NEAR-SIGHTEDNESS.

Myopia, or "near-sight," is by far the most important, as it is also one of the most common, of the refractive defects of the eye. In the other forms of abnormal refraction we have merely a defect of construction, giving rise, it is true, to annoying disabilities, but having no tendency to further changes of structure or function. Near-sightedness, on the contrary, where it exists in a high degree, is not simply an infirmity, as is usually supposed, but is, in many cases, associated with grave disease of the posterior parts of the eyeball, having progressive tendencies, and not seldom resulting in loss of all useful

vision. It has, furthermore, a strong disposition to hereditary descent, re-appearing in the children or grandchildren of myopes.

The defect in form, in short-sighted eyes, does not consist, as was formerly supposed, in an undue prominence of the front part of the eye, but in an elongation of the whole globe from before backwards; so that it assumes an olive or egg shape, instead of being round. This lengthening mostly occurs at the back part of the eyeball, and is not to be observed at first sight; but, in many cases, we may see that the eye has this altered form, and extends back farther than usual in the socket, by drawing the lids apart at the side next the temple, the eye being at the same time turned towards the nose.

All the coats of the eye are implicated in these changes, which take place, sometimes by gradual expansion at every point, but usually by a more considerable giving way around the entrance of the optic nerve. In examination of such eyes after death, a posi-

tive bulging of the sclera is seen at this point. During life, we can observe these changes, and watch their progress, by means of the ophthalmoscope. This instrument, by which we are enabled to illuminate and explore the interior of the eye, has thrown new light upon the whole subject of near-sightedness. By its aid we are able to follow the morbid changes as they are successively developed. We can distinctly observe the progressive giving way of the retina, optic nerve, choroid, and sclera, to form the bulging which is termed posterior staphyloma; can notice the congestion and other changes following imprudence; and, too often, can see the advent of separation of the retina from the choroid, with its accompanying loss of sight.

As the retina expands with the general enlargement, the nerve tissue, in that layer of the retina which is the seat of its especial function, is, of course, extended over a larger surface, and its perceptive power proportion-

ally weakened. Many such eyes are therefore unable to see distant objects with normal clearness, even with the glasses which most completely correct their myopia, although they see small near things perfectly well. It seems to be necessary that a larger number of rays should fall upon a given area of the retina in order to produce a distinct impression. This lack of acuteness of vision is often much greater in the evening; so that persons thus affected cannot then see to drive a horse safely, or distinguish the outlines of objects.

Eyes which are but slightly myopic often see nearly as well as others, at a distance, by the aid of suitable glasses; and they have almost microscopic vision of near objects, and can read in a dim light. These facts have given rise to the popular belief that near-sighted eyes are stronger than others, and able to bear every kind of use and abuse; and the delusion is encouraged by the disposition shown by myopic persons to choose occupations requiring close sight, and by

their ability to read at an advanced period of life without glasses. This belief would be well founded but for the tendency to the gradual changes already described.

The progress of the alterations in the posterior parts of the eye is favored by the stooping position of the head, which allows the blood to accumulate in the vessels of the eyeball, and by too-long continued use of the eyes upon minute objects, which requires such action of the external muscles that the globe is compressed from side to side, and is thus made to yield still further at that part where the already thinned tissues offer but slight resistance. With each degree of change, the process becomes easier; the eyeball grows misshaped, to a degree which limits its motions in the socket; and the eye most affected no longer acts with its fellow, but is disposed to turn outwards, and to give up attempts at vision.

With increased implication of the retina in the morbid changes, its perceptive acuteness is

more or less reduced, especially as regards distant objects; and glasses no longer give them the same clear outlines.

The morbid processes may be arrested at the early stages of their development; and, by good fortune and prudent management, the eyes may retain through life nearly the normal powers; or, if even considerable changes have taken place, these may remain stationary, and give rise to little inconvenience: but if they are not recognized, and means taken to avert their progress, they may go on till the retina becomes useless, being separated from the choroid by fluid which collects between these membranes.

The changes I have described are insidious in their course. Slight warnings are sometimes felt; but, as a rule, the eyes, unless examined with the ophthalmoscope, exhibit and feel no symptoms calculated to excite alarm, except, perhaps, an increase of the myopia, which frequently, but not invariably, occurs, often unnoticed by its subject. After

reaching a certain degree, there is little hope that further changes will be averted by any care or skill. The conditions have become so unfavorable, that the morbid tendencies can no longer be successfully opposed; and each year sees a downward progress. Even where the staphylomatous enlargement has not been excessive, separation of the retina will sometimes suddenly occur. I have repeatedly seen cases where this had taken place within a single twenty-four hours after some unusual exertion of the eyes, and where blindness was already nearly complete.

It is quite time that the attention of the community was drawn to a matter of so much importance. At least in some classes of society, the possibility of blindness at or near middle life from changes incident to excessive near-sightedness, as well as the predisposition to transmit the same infirmities and liabilities, ought to be taken into account in forming matrimonial alliances, like any other impending disability from incurable ailment. The

fact of its being frequently inherited once understood, parents should watch for any early manifestations of its presence in their children, and take measures to prevent its progressive increase. Teachers should impose upon myopic eyes as little as possible of studies requiring close application, even though, at the time, the child makes no complaint. It is questionable if our system of education, augmenting as it does the frequency and degree of near-sightedness, is an advance in civilization. It would be better to go back at once to the oral teachings of the schools of Athens than to go on creating our favorite type of educated men and women at the expense of their own and their children's eyesight.

No medical skill can bring back these delicate tissues, once distended, to their former healthy condition; or even, in some cases, prevent the steady onward march of the disease. But prevention is, in a measure, within our power. Myopic eyes should not be used

continuously for small objects, and especially with the head bent forward; fine and bad print should be a fatal objection to a school-book; the use of lexicons, or close mathematical work, should be limited and interrupted; written exercises should be almost dispensed with; and the child should be spared search upon the map for unimportant places. The book should be held up when possible; and the pupil should not keep his head leaned over his desk, nor be allowed to study by a feeble light.

If by these precautions the child reaches adult age without any considerable development of his myopia, he will thenceforth be comparatively safe, as changes are less likely to occur after this period. But if, from thoughtless mismanagement, large and progressive structural alterations of his eyes have been brought on during his years of study, he may not only find himself disabled from pursuing such other occupations as he may desire, but may be in a condition foreboding further misfortune.

Except when slight, myopia lessens little, if at all, with age; but it sometimes happens with those who are only a little near-sighted, that, while still requiring concave glasses for clear vision of distant objects, they will, after middle life, also need convex glasses for reading.

There are a few cases of apparent myopia where this does not really exist; as sometimes in children or aged persons affected with cataract, or where ulceration or other disease has existed. But it is sufficient here to refer to these as possible, without attempting their description.

The axis being too long in myopic eyes, parallel rays, such as proceed from distant objects, are brought to a focus at a point so far in front of the retina, that only confused images are formed upon it. Such a male-formation, constituting an excess of refractive power, can only be neutralized by concave glasses, which give such a direction to rays entering the eye as will allow of their being

brought to a focus at the proper point for distinct perception. It is, therefore, irrational and useless to attempt a substitution of other means, instead of resorting to these glasses, which, by rendering parallel rays divergent, adapt them for the excessive refraction of the myopic eye, thus relieving an infirmity which is not to be removed.

The use of glasses for distant vision is often objected to by parents and friends, from an idea that the short-sightedness will thus be increased, or in the expectation that the eyes will become of normal power at a later period if glasses are not worn. Both of these opinions are erroneous. Myopic eyes are not injured by wearing suitable glasses; but, on the contrary, are often preserved from injurious pressure on the globe in the indulgence of the habit of nearly closing the lids in order to obtain a clearer impression of the images of distant objects, as is commonly done when glasses are not worn. Nor will the myopia be appreciably lessened by abstinence from

glasses. It is best, therefore, not to deprive young people of the many pleasures arising from distinct vision of things around them, in the illusive hope that the great sacrifice thus made will be compensated by any benefit.

Such glasses should be selected as make distant objects clear without lessening their size and giving them an unnatural brilliancy. If no glass gives this clearness, the acuteness of perception may have already become impaired, or there may be a complication of the myopia with astigmatism. Many myopes use the same glasses for reading or music which they wear for distant vision. It is best, however, when the myopia is but slight, to dispense with these in reading, sewing, &c.; or to wear a lower number, such as will allow of distinct sight at the distance where the book or music would ordinarily be placed.

HYPEROPIA, OR OVER-SIGHT.

The condition termed hyperopia is the opposite of short-sightedness, and consists in

abnormal flatness of the eyeball from before backwards, with, in some cases, a positive smallness of the globe in all its dimensions. This maleformation may be seen at the outer extremity of the orbit by separating the lids while the eye is turned towards the nose, the eyeball having somewhat the shape of a turnip.

The antero-posterior axis of such eyes being too short, their refractive power is not sufficient to bring even parallel rays to a focus upon the retina, but is adapted for convergent rays only. It is therefore evident that convex glasses, which, by rendering parallel rays convergent, compensate for this deficient refractive power, must be the only effectual means of relief. This condition is not to be confounded with old-sight, where the refractive power is perfect, and distant vision good.

Where the hyperopia is of moderate degree, the exercise of the accommodative function in aid of the refraction is sufficient to give clear vision of distant objects, and even

for reading during childhood and youth. But glasses will be required for reading at an earlier age than they are needed by normal eyes; and, in the mean time, such eyes should be carefully used, and never employed for a long time upon small objects, especially in a feeble or artificial light. When the hyperopia is of greater amount, almost any continuous use of the eyes is painful, and convex glasses are indispensable, even sometimes from the age of six or seven years.

This imperfection of the eye is often undetected for a considerable time, during which a child thus affected experiences great annoyance, and gets very little sympathy. The child is able, as a general rule, to see at a distance; and perhaps, by using nearly all his accommodative power, obtains even clear images of large objects. But if, on a dark day, or when confused by the presence of strangers, he is asked to read a fine or blurred print, his sight soon becomes confused, and he ceases to distinguish the words. He stam-

mers and hesitates. His parent or teacher, knowing that he has read the same lesson well enough at other times, thinks him stupid or wilful; and reproaches or punishments are perhaps administered, which, by disturbing the nervous system, lessen yet more his power of accommodation, and increase his visual inability. The child is himself at a loss to understand why he cannot then see what he knows he has seen.

It is, perhaps, accidentally noticed that such a child sees well with his grandmamma's spectacles: but this discovery is often only received with an outcry of astonishment; the glasses are snatched off; and he is denied this assistance, the only means which can be of real use to him.

Instances are now and then met with where glasses are even more necessary at six or eight years of age than they are to the majority of healthy eyes at sixty years. But this extreme hyperopia is less frequent than moderate degrees of this imperfection occur-

ring in youths and young adults. These have been able to use their eyes during childhood with little difficulty by making constant use of their accommodative power; but, as this begins to lessen from the age of ten years, they at length observe symptoms of what is termed asthenopia, or weak sight, and feel pain in the eyes, or above the brows, after long-continued use.

As is well known, convex glasses have the property of bringing parallel rays to a focus at a distance from the glass corresponding to its degree of curvature. Thus they assist hyperopic eyes by rendering rays so far convergent before they enter, that, even with its deficient refractive power, the eye is able to form a distinct image on the retina without any further exercise of its accommodative faculty than is required in a normal eye. It is evident that such glasses are the only rational and efficient means of relief for hyperopic persons. They may be worn both for distant and near vision, enabling the eyes to

refract parallel rays sufficiently while keeping the accommodative power in reserve, as in the normal eye, for the concentration of the divergent rays which proceed from small near objects.

The glasses should be such as afford the clearest and most comfortable vision: but it is often necessary to wear at first a weaker number than is subsequently needed, or than will entirely neutralize the hyperopia; because the eyes have been so long accustomed to exert their accommodative power for all purposes, that it is difficult at once to relax this effort when looking at distant things, although the glasses supersede the necessity for it.

SQUINTING AS A CONSEQUENCE OF HYPEROPIA.

It was first shown by Professor Donders of Utrecht, that nearly all the cases of squinting towards the nose, "cross-eyes" as they are sometimes termed, are accompanied by and result from hyperopia. This convergent stra-

bismus, or squint, is caused by excessive use of the muscles which turn the eyes inwards, in the endeavor, by increase of the accommodative effort, to obtain distinct vision.

It is very important that this defect should be remedied in early childhood, as, if allowed to continue, vision frequently becomes so much impaired in the eye which is most deviated, that it is not regained after an operation performed at a later period. When occurring later in life, where glasses can be intelligently used to correct the hyperopia, the strabismus may be relieved by this means. Glasses are often required, after an operation, to increase and maintain its good results ; but, in matters so important, competent advice should be obtained, without heeding the counsel of friends who advise delay.

ASTIGMATISM.

Astigmatism usually depends on a difference of curvature in two meridians of the cornea; so that rays passing through one meridian are

brought to a focus sooner than those passing through a plane at right angles to the first.

Persons having this defect of refraction sometimes observe that they see certain lines more clearly than others: vertical lines, for instance, will appear well defined, while those which are horizontal are indistinct, or *vice versâ*. In many cases, however, their attention has not been directed to these phenomena; but they are only conscious that they see with difficulty and pain if the eyes are much used. In some instances, they have tried convex or concave glasses with little benefit. Frequently so much irritation and congestion of the eyes has been induced, that these symptoms are at first supposed to constitute the disease, the primary affection being overlooked.

Astigmatism may be present in an eye otherwise normal, or may co-exist with hyperopia or myopia. Its degree, or its meridians of greatest variation, may be different in the two eyes; which should, therefore, be separately tested. It can only be relieved by glasses

ground upon cylindrical instead of spherical surfaces, so as to refract rays passing through one meridian, while those at right angles to it are unaffected. The glasses must be accurately fitted, and their frames carefully adapted to the eyes, as any deviation of the axis of the cylindrical glass from its proper direction with regard to the faulty meridian of the cornea lessens, or even nullifies, its corrective power.

Immense relief is often found in wearing these glasses; and unbounded gratification is sometimes expressed by those who, after many fruitless endeavors, see by their aid for the first time with real distinctness.

Convex-cylindrical and concave-cylindrical glasses are now kept for sale by many opticians; and, where other glasses fail to give relief, the eyes should be tested with parallel vertical and horizontal lines. The selection of cylindrical glasses is, however, often a question involving nice adaptation to complicated conditions of refraction; and, in the mixed

and compound forms of astigmatism, it is sometimes necessary to have glasses ground of different curvatures upon their two surfaces to suit each case.

ACCOMMODATION OF THE EYE.

Thus far we have considered the eye as an organ possessing refractive powers only; but it has other capabilities as an optical instrument in its admirable power of self-regulation, by which it is able to adapt itself spontaneously for seeing distant or near objects. This is termed the faculty of accommodation.

In looking at distant objects, the normal eye is in a state of rest; and the parallel rays which enter it from such objects are brought to a focus, so as to form a distinct image upon the retina, by the refractive power alone, without calling into play the accommodative function.

Rays proceeding from near objects are no longer parallel, but diverge from each other, and require an increased focal power for their

concentration to form a clear retinal image. This increased power is supplied by accommodation.

Accommodation of the eye for vision of near objects is obtained by two distinct but intimately associated muscular efforts. The eyeballs are turned towards each other by the internal recti-muscles, so that the diverging rays may enter each eye in the direction of its axis, and not obliquely; and at the same time the ciliary muscle, within the eye, acts upon the crystalline lens, and increases its convexity, augmenting, in so doing, its refractive power, and thus giving to the divergent rays the same direction towards the retina as if they had entered the eye as parallel rays.

The accommodative power may be weakened or lost from various causes.

OLD-SIGHT.

To many persons, the discovery that they do not see as well as they once did is the first intimation of receding youth. Infirmities,

wrinkles, they may have none; but they suddenly become aware that they sometimes cannot thread a needle or read fine print without fatiguing effort.

At first, such a person finds that he can still read any print by placing the book farther from his eyes, thus rendering the rays less divergent, or by holding it near a light, so as to obtain a better illumination of the page, and thus increase the number of luminous rays which enter the eye. At length, however, he finds that neither holding the book at arm's-length, nor going nearer the light, will give him his accustomed vision, especially in the evening or on a cloudy afternoon. Fine print appears blurred; and, if read at all, it is slowly and with difficulty. If he writes in the evening, he perceives the next day that he has written larger than his ordinary hand.

Meanwhile, perception of distant objects is as clear as ever; and many an individual, puzzled to account for the loss of his former minute vision, struggles in vain to continue

some of his favorite pursuits and to read his evening newspaper comfortably, until, perhaps, he tries on a convex glass, and his rejoicing eyes at once regain all their faculties.

One of the parts principally concerned in accommodation, the crystalline lens, gradually increases in hardness; and, in most eyes of previously normal accommodation, this hardness attains such a degree at about forty-five years of age, that the ciliary muscle can no longer effect the change of form in the lens which is requisite for the concentration of divergent rays; or, if this can be done for a short time, the eye soon becomes conscious of a fatiguing effort, and is forced to abandon it. This state of things is presbyopia, or old-sight.

It is evident from this explanation of the changes in the lens, that a suitable convex glass, which lessens the divergence of the rays before they enter the eye, and thus calls for less effort of accommodation, must be the sole means of relief.

The advice often given to those who begin to experience symptoms of presbyopia, to put off the use of glasses as long as possible, is injudicious; and the assertion, that persons who decline to use glasses for a certain time will be able always thereafter to dispense with them, is wholly erroneous so far as regards normal eyes. It is generally made by those who are themselves short-sighted, and for that reason are able to see small objects without glasses at and after the age when others require their assistance.

But the use of convex glasses may be postponed for a while, without injury to the eyes, in deference to the reasonable wish of a lady to appear young as long as possible, or from any motives of convenience or preference; provided the eyes are used but sparingly for small objects, especially when the light is dim.

Such glasses should be chosen as render objects clear without much enlarging them. At first, they may be needed only in the even-

ing or on a cloudy day; but, as each year lessens the accommodative ability of the eye, it follows that glasses will be more and more constantly required. After a time, their focus must be increased, because of the renewal of the original symptoms; the lens having undergone yet further hardening, and become less capable of accommodative change.

LOSS OF ACCOMMODATION AFTER ILLNESS.

After certain diseases, among which diphtheria, measles, and scarlatina may be especially mentioned, the accommodative power is often partially or almost wholly lost. In diphtheria, this loss of power in the nerves supplying the ciliary muscle is often associated with partial and temporary paralysis of some other nerves, particularly those of the throat. For the time being, the person is more or less unable to see small objects, to continue reading, &c. But, although the recovery of these delicate nervous functions is often gradual, they may be restored by appro-

priate treatment as the system gains strength. Every care should be taken to avoid prostration of the nervous system; and the eyes must be sparingly used until they regain the ability to work without fatiguing effort.

INSUFFICIENCY OF THE INTERNAL RECTI MUSCLES.

Besides the change of form in the lens, we have also, in accommodation for near objects, a convergence or turning of the eyes towards each other. This is effected by the action of the internal recti muscles, which turn the eyeballs inwards towards the nose. Rays from an object thus enter the two eyes in such a direction as to fall upon corresponding portions of their retinæ, and form there images which harmonize with each other. If these converging muscles act too feebly, although the accommodation may be good as regards either eye when used alone, the other eye being covered, there will be a want of harmony in the images formed in the two

eyes when used together, so that a confused impression will be conveyed to the brain. The efforts made by the enfeebled muscles to maintain their accustomed action cause a feeling as of strain at the inner side of the eyeball, near the insertion of the muscles, the discomfort often extending to the forehead above the eyes.

Continuous use of the eyes, when insufficiency is present, brings on a sensation similar to that experienced when any other muscle is kept too long upon the stretch; as, for instance, when the arm holds up a heavy weight. Frequent intervals of rest should therefore be allowed such eyes.

A disposition to turn outwards is often observed in very near-sighted eyes, but is then generally associated with serious internal changes, which claim the first attention.

EYE-GLASSES.

The use of glasses becomes a necessity or convenience, at some time in their lives, to a

large proportion of the people of civilized communities. If short-sighted, they require glasses in youth, as well as in age, for distant vision. If possessing normal eyes, they need assistance, with advancing years, for seeing near objects. The comfort and safety of the eyes often depend on a proper selection of these auxiliaries.

The glasses in most common use have their two surfaces ground of the same curve, convex or concave upon each side. Periscopic glasses, in which the two surfaces are of different curvature, are sometimes worn, as giving rather more range of vision without turning the head; but their optical qualities are in some other respects less perfect than those of the usual form.

To avoid the trouble of changing from one pair of spectacles to another, two different foci are sometimes combined in the same glass, — the lower portion being ground to the focus adapted for reading, and the upper part to that suited for distant vision. The

same result is also obtained by setting two halves of lenses of the two different foci in the same frame.

Cylindrical and prismatic glasses are intended only for certain special conditions of refraction, more common than was formerly supposed, and which, when existing, are but slightly relieved by the ordinary forms of convex and concave glasses.

Near-sighted persons should select the lowest number of glasses which make vision clear at a distance without rendering objects smaller and unnaturally brilliant. If any difficulty is met with in finding such glasses, the eye should be examined by some competent authority to determine if any unusual combination of lenses is required, or ascertain the presence of disease if the difficulty in suiting the eyes arises from this source.

When convex glasses are required by hyperopic persons for distant vision, they should be of such power as to render every thing distinct. Those used for reading should make

print clear at the usual distance, without magnifying much. Persons who need glasses of different foci for near and distant sight should not wear their reading-glasses when looking at a distance; for, if they do so, they will find them less serviceable in reading or sewing, and soon require a higher power.

The frames of glasses may be round, oval, or of any form, and of various material, according to fashion or preference. As a rule, light materials and large glasses are best. If the nose is so shaped that eye-glasses can be kept in place without having too strong a spring, they may be worn, if preferred, rather than spectacles; but, if the spring is too strong, it often causes pain by its pressure on the nerves around the eyes. Cataract glasses should generally be mounted as spectacles; for they are worn almost continuously, and their weight makes it difficult to keep them upon the nose if framed as eye-glasses.

Whatever style of mounting is preferred, the frames should be adapted to the form of

the bridge of the nose, and to the distance between the eyes; so that, as a rule, the centres of the glasses shall be in front of the pupils. Men generally require frames with longer bridges than women, because of the greater space between their eyes. Silver frames are perhaps the most economical for the poor, since, if bent or broken, they can be repaired.

Pebbles, as they are called, are often praised as having qualities excelling those of ordinary glasses; but this is not the case to any considerable extent, even when they are made with care and at a much higher cost than other glasses.

Tinted glasses, or those having wire-gauze around their border, are often worn as protectors against light and dust. When used to defend sensitive eyes from light, a mild blue is generally more grateful than a neutral tint; but a neutral or French gray may be worn if more acceptable to the eye. Green glasses are to be avoided in most cases, as

they do not absorb or neutralize the irritating rays in the spectrum of light as it passes through them. Inflamed eyes often find most relief from glasses surrounded by wire-gauze, which exclude wind and dust as well as light; but these should not be worn so closely as to keep the eyes heated.

Very thick plate-glasses, set in spectacle-frames, are sometimes used as a safeguard by stone-cutters, machinists, &c., whose eyes, when unprotected, are often fatally injured by the penetration of particles of metal driven with great force into the interior of the eye-ball.

THE OPHTHALMOSCOPE.

In looking into an eye, our unaided vision usually penetrates but a little way beyond the pupil; but by means of the ophthalmoscope, invented a few years since by Professor Helmholtz of Heidelberg, we are able to explore the depths of this organ, and detect the smallest variations from a healthy condition.

The room being darkened, the rays from a light placed near the head of the person to be observed are reflected into his eye as if they came from the eye of the observer; and the latter, by looking through the central aperture in the instrument, can examine the illuminated interior of the eyeball, perceiving every detail of healthy structure or morbid change as accurately and clearly as we can see any part of the exterior of the body. All this is done without injury or discomfort to the eye looked at; and the diseases of its internal parts, heretofore hidden mysteries, can be studied and understood perhaps more perfectly than those of any other organ of the body.

The benefits derived from the ophthalmoscope are not limited to the better knowledge and earlier discovery of morbid affections of the eye itself. This means of observation also enables the physician to detect diseases of distant organs by the manifestations of their presence exhibited in secondary changes

in the deep-seated tissues of the eye, and to avert impending mischief to the brain by timely discovery of its indications in the optic nerve and retina, in season to counteract the subtle influences threatening life or reason.

DEFECTS OF SIGHT FROM MALEFORMATION OR FROM CERTAIN STRUCTURAL CHANGES.

In a considerable number of cases where the eyes of children appear healthy upon an ordinary inspection, there is more or less want of acuteness in the sight, which is little, if at all, relieved by any glasses. Examination with the ophthalmoscope shows, in some cases, an imperfect development of the retina and choroid; in others, there is commencing cataract; in others, the cornea is slightly hazy from previous ulceration, or it is conical in its form.

A frequent symptom in these cases is a disposition to bring objects quite near the eyes; but even then they are but dimly seen, and

not as they would be were the child merely near-sighted, — with great clearness.

Such children should not be required or allowed to apply their eyes closely to small objects; and they should be carefully examined by a skilful professional man to determine the precise condition of the eye and its proper management.

Complete or partial blindness may occur during pregnancy, or while nursing; but this should not cause too much alarm, as, if unaccompanied by permanent morbid changes, it may be expected to disappear, slowly, after termination of the causes which gave rise to it. But careful inquiry should be made as to the presence of any complicating circumstances; for, if such exist, the spontaneous recovery of sight cannot be so confidently hoped for.

BAD PRINT.

No protest can be too earnest against the manner in which many books, especially

school-books, are printed. Surely, if an author's work has any value, it deserves better than to be sent forth in so poor a garb. What is worth printing at all, at least as regards books intended to be constantly used or extensively read, is worth being well printed, with clear type, upon a fair page. Every thing should be done, so far as the arts may serve the interests of learning and science, to make study a pleasure, instead of rendering it an irksome and injurious task.

If and while eyes are strong they may offer only feeble remonstrance against the harm they suffer in being forced to decipher that which bad type, ink, and paper have combined to make illegible, yet the day of reckoning comes at last, and many eyes must cease their labors, and many minds, full of useful projects, must abandon their plans, because the eyes, those long-enduring instruments of research, have given way to the continued strain to which they have been needlessly subjected.

WOUNDS AND INJURIES OF THE EYE.

The subject of accidental injuries of the eye is one of great importance, as the recovery or loss of sight may often depend on what is done immediately after the accident, before the eye is seen by a physician.

Travellers, especially by railroad, are liable to the lodgement of small particles of dust or cinders inside the lid, or upon the front of the eyeball, causing great suffering. These should be removed as soon as possible, before the eye becomes excessively sensitive, and before they give rise to inflammation. Sometimes these foreign bodies are to be seen, on close inspection, lodged in the front of the cornea, where they are not felt when the eye is open, though every movement of the lid over them causes much pain. If not firmly embedded, they may be removed by means of a bit of wood, say a toothpick, sharpened to a flat point, or even by a camel's-hair brush; but, when forcibly implanted, they are some-

times so firmly held in place, that their extraction requires a skilful hand. When fixed in the centre of the cornea, with the dark pupil as background, they are frequently overlooked at a first inspection. If the foreign body is not found in this situation, it will be discovered, in nine cases out of ten, inside the upper eyelid, and generally at about the centre of the lid, near its border. Thus placed, it scratches the cornea at each motion of the lid or eyeball, and causes great irritation. Such particles, once slightly embedded in the membrane lining the lid, may remain there a long time before being expelled by natural efforts.

If the eyelids are closed for a few minutes soon after the entrance of the foreign body, so as to allow the tears to accumulate, and the skin at the centre of the upper lid is then taken hold of with the thumb and finger, and drawn forward so as to lift the lid from the eyeball, the intruding particle is often washed away with the outflow of tears.

If relief is not obtained after two or three trials of this plan, and no physician is at hand, it will be best to ask a travelling-companion to turn the lid, and remove the offending substance; but, if this should be a grain of light-colored dust or sand, good eyes or eye-glasses will be needed to detect it.

The upper eyelid may be easily turned by taking hold of the eyelashes and edge of the lid with the thumb and finger of the left hand, and drawing the lid outwards and upwards; while at the same time a small pencil, a knitting-needle, or some similar thing, held in the right hand, is placed against the centre of the lid, pressing it backwards and downwards towards the eyeball. The person should look down, as this greatly facilitates the eversion of the lid, which may be easily accomplished if these directions are followed. The cinder or dust may then be wiped off with a handkerchief or the finger.

Smoothly-worn bits of shell from the beach are sometimes inserted as "eye-stones;" the

popular idea being, that they pursue the foreign body, and bring it out, *vi et armis*. But these, generally, only add to the sufferer's discomfort; and in the few instances where their introduction is followed, after more or less delay, by the escape of the original intruding substance, they merely serve by their bulk to separate the eyelid from close contact with the globe, and thus allow the sand or cinder to be washed from its position by the abundant tears. Much harm is often done by their presence, the remedy proving even worse than the disease.

It is so common for machinists and stone-cutters to have atoms of metal driven into the cornea, that, in most shops, some one of the workmen acquires repute for a certain skill in removing them. But, when the metal is deeply lodged, their efforts often fail; and the cornea is sometimes injured by their attempts, or so much abraded, that the eye becomes exquisitely sensitive; and, when the sufferer applies for professional aid, it is almost im-

possible for him to keep the eye still enough to allow of the extraction of the metallic fragment. Sometimes etherization is necessary in such cases before the removal of the foreign body can be effected.

But workmen are also liable to far graver injuries from bits of metal which penetrate the eyeball instead of lodging upon its surface. In using a hammer and cold-chisel, small bits of steel are often broken from the edge of the tool, and driven with great force into the eye. Having once passed through the tough external coats of the eyeball, there is little to prevent their going on to the very bottom of the eye. These accidents are very deceptive. The workman, perhaps, thinks his eye has only been hit externally by a bit of metal which he was chipping off; and as he feels at first very little pain, and his vision, it may be, is not much affected, he is unwilling to believe that any thing has entered the globe. But, if examined, conclusive traces are often found of the course of the missile

towards the back of the eye; or it may sometimes be seen lodged in the iris or the crystalline lens; or the ophthalmoscope may even detect its presence in the deeper parts of the globe. Usually the man is soon convinced, by the continued irritability of the eye and the increasing failure of his sight, that his is more than an ordinary trivial injury.

Many eyes are yearly lost from bits of percussion-caps, which boys amuse themselves in exploding by carelessly striking them with a stone or hammer. Such dangerous playthings should be absolutely forbidden.

In any of these cases, no time should be lost before consulting a skilful oculist, if possible; if not, the ablest medical practitioner within reach; as the chance not only of retaining any vision in the wounded eye, but of preserving it in the other, may depend on the advice given and the treatment adopted immediately after the injury. The possibility or expediency of the removal of the foreign

body should be determined by a man of experience; as, if such a substance is allowed to remain in certain parts of the eyeball, it excites, in very many cases, a peculiar form of sympathetic inflammation in the other eye, and destroys the sight.

Grains of powder are frequently driven into the eye by premature explosions, &c. If near the centre of the cornea, and of some size, they should be carefully picked out, as far as may be, soon after the accident. But small particles may remain, even in the cornea, without doing harm; and, if they have been some time in the eye, they become incorporated in the surrounding tissues, and should not be disturbed unless they cause conspicuous deformity.

Burns, or injuries from acids or other chemical substances, or freezing of the cornea during exposure to intense cold, are usually followed by dangerous ulceration, or even by complete loss of vitality in the cornea. Such cases should never be neglected.

Clean cuts of the eyeball, with sharp instruments or pieces of glass, even when quite large, often result in a good recovery. Lacerated wounds, made by blunt instruments, sticks, horns, and the like, terminate less favorably. In all these cases, the friends of the injured person should avoid curious meddling with the eye "to see how much it is hurt;" and it is well to keep both the eyes closed and quiet, as if asleep, that the wound may be as little disturbed as possible until it can be seen by a physician. No other applications should be made than a thin, folded rag, wet with cold water; close, heavy bandages, which might press heavily upon the eye, and every thing like poultices, being especially avoided. No eye-water of any description should be used, except under the direction of the medical adviser; for the redness and swelling of the eye ball and lids depend on the existence of the wound, and will subside as this is healed, but are not to be got rid of by mischievous activity in the use of such

remedies as might be serviceable in a different form of inflammation.

Penetrating wounds of the eye from scissors, pin-darts, needles, &c., *may be* trivial, if the important internal parts are not involved; but they are often more serious than appears at first sight. And the fact that a child makes little complaint after such an injury should not put a parent off his guard: for in these cases, as in most lacerated wounds and those produced by blows from blunt objects, we have to fear, not merely loss of vision, but shrinking or deformity of the eyeball; and, what is far more serious, there is, in many cases, a risk of loss of the other eye from sympathetic inflammation. This last consequence is especially likely to happen if the injured eye continues irritable and sensitive, or if it becomes so after having been for a time free from active symptoms.

The very frequent occurrence of total loss of sight from sympathetic disease coming on insidiously in the internal parts, and with

very little warning, ought to be kept in view in every case of injury of the eyeball, until such time as the danger is pronounced by some competent authority to be past; and, if threatening symptoms present themselves, there should be no hesitation in sacrificing the injured globe, if necessary to the safety of the other eye.

SYMPATHETIC INFLAMMATION OF THE EYE.

When one eyeball has been seriously injured, or a foreign body remains within it, especially in the ciliary region, a little behind the line of union of the transparent cornea with the sclera, or in some instances of displacement or disorganization of internal parts, the other eye, previously healthy, becomes affected with a slow internal inflammation of a most destructive nature.

The early symptoms are often so slight as not to attract notice, unless they have been watched for; and they are at length observed only too late for effective treatment, if they are

looked for only in the uninjured eye. The first premonitory signs are to be seen in the eye which has been diseased or hurt; and it should be vigilantly watched as long as any sensitiveness lingers to justify suspicion.

Should warnings in the injured eye be disregarded, the other eye may begin to show a faint blush of redness just beyond the margin of the cornea; the movements of the pupil become sluggish; and it is perhaps found that vision is less good than usual in a feeble light. These changes increase, though varying, and seeming to improve at times; until at last the eye becomes very red, watery, and perhaps painful; the pupil is closed by a deposit of opaque material; and the globe finally shrinks, and is sightless.

Occasionally an eye escapes without loss of vision after these processes have begun, provided the injured eye, the source of the sympathetic irritation, is promptly removed; but it is best, where the state of the other eye indicates a tendency to mischief, not to wait

for the appearance of even slight symptoms of disease in the sound eye, as, unfortunately, they cannot always be arrested, when once established, by even the promptest action on the part of the surgeon.

When an eyeball is removed under these circumstances, there is often an immediate sense of relief from dull pain which had previously existed in the eyes and forehead. The globe being enucleated without the removal of the muscles and other contents of the orbit, a sufficient support is left for an artificial eye. Though such an operation is formidable in anticipation, it is painless in execution after etherization; and the wound is readily healed, often within two or three days.

More or less serious changes may occur within the eye as the result of concussion, without external wound; as, for instance, from a hit by a cork from a bottle, the end of a whip-lash, a ball, or any other sudden shock. The anterior chamber, the space between the cornea and the iris, is often at once

filled with blood, and vision temporarily lost; but the blood is re-absorbed and sight restored in a few days, if no other harm has been received. The iris may be partially torn or separated at its border, forming a second pupil, but not seriously damaging the visual functions. Sometimes the crystalline lens is dislocated, or the capsule enclosing it is ruptured. This may lead to inflammation by pressure upon neighboring sensitive parts; or, where no change is immediately apparent, may result in the formation of cataract, the lens gradually becoming cloudy within a few months; or the retina may be separated from its connections, and its perceptive faculty destroyed. As, in any such injury from concussion, there is a possibility of sympathetic ophthalmia at a subsequent period, all such cases should receive careful attention.

ARTIFICIAL EYES.

When vision is lost in one eye, and the globe is more or less disfigured or shrunken,

a person is often desirous to conceal the deformity, in order not to attract notice, and to restore the natural expression of the features.

An artificial eye may be worn when the eyeball is but slightly lessened in size, or when the globe has been removed; but the most favorable condition for its use is where the anterior parts of the eye have been destroyed or removed, leaving a somewhat diminished globe, to which the muscles remain attached. It is important that no extensive adhesions should exist between the eyeball and the lids.

Artificial eyes are in the form of a thin shell, made of a sort of glass termed enamel, and as light as possible, that they may be moved readily by the muscles of the globe in harmony with the movements of the other eye. They should not be too large, as, in this case, their movements will be limited. The form should be adapted to that of the socket in which they are to be worn, their edge not pressing too much against any part of it.

They should appear, when worn, a little smaller, rather than larger, than the other eye, as a staring look is thus avoided. In color and in size of the iris and pupil, they should correspond as nearly as possible with the other eye; but a difference of color is of less importance than to have the eye of a form and size which will be comfortable and movable.

Very slight differences greatly alter the effect of the eye when inserted. It is, therefore, very difficult to obtain a suitably-fitting eye, except by personal selection from a large number of specimens; and, if once well fitted, a person would do well to order other eyes of the same pattern, otherwise it may not be easy to replace an eye with another as well adapted, when the first becomes rough or is broken.

Like other modern substitutes for natural deficiencies, — hair, teeth, wooden legs, &c., — artificial eyes should be laid aside at night. In fact, it is well to take them out occasion-

ally in the day-time, and bathe the orbital cavity, in order to avoid the slight irritation caused by their constant presence, and to preserve the eyes from becoming roughened by constant soaking in the tears and other discharges. But, even with these precautions, the surface of the enamel loses its polish after a while, usually in from one to three years; and the eye must then be exchanged for another. If worn after becoming rough, the secretions from the lining of the cavity are greatly increased; and it becomes inflamed, and covered with fungous granulations to such an extent, that the artificial eye can no longer be introduced. But these granulations, however large, must be left to shrink away under the soothing effect of frequent lotions with water or other mild means. If they are cut off, the cavity is almost always rendered smaller, and subsequently will not admit the false eye. Of course, in these circumstances, the eye must be laid aside until the recovery of the healthy condition.

Where a good fit, well matched with the other eye, is obtained, artificial eyes are not to be detected by an ordinary observer; and they restore good looks and a natural expression to the face, so completely, that, after a time, even a person's friends forget the counterfeit. They require care, however, both in their selection and use; and those to whom looks are a matter of slight consideration sometimes find them more trouble and expense than they think them worth.

CREDULITY AND PRESUMPTION IN REGARD TO THE EYE.

The willingness of the public to patronize pretended oculists, and to recommend certain popular remedies as being infallible for the cure of eye-disease, is a source of pain to every one who witnesses in our hospitals and blind-asylums the lamentable consequences. Intelligent people would be slow to confide their important business, their farms and merchandise, to the hands of travelling law-

yers of uncertain reputation, whom they saw for the first time, and never expected to see again: yet they intrust their eyes, worth more than house or lands, to the care of roaming pretenders, whose own assurances are the only warrant of their skill; and who, when their ignorance and failures become too glaringly evident in one place, flee into another. Or, again, a mother thinks it no harm to follow the recommendation of nurse or neighbor, and apply a poultice to the inflamed eyelids of her babe; little dreaming, that, in so doing, she is dooming it to blindness, and never asking herself how much the presumptuous adviser could know about the matter. An individual who has suffered from some affection of the eye, and found relief in a certain remedy, too often seems to feel himself authorized to advise all the rest of mankind attacked with eye-disease to use the wonderful specific to which he ascribes his cure. One person spoils the eye of a friend's child by recommending a wash containing

sugar of lead; another, equally ignorant where he assumes to be wise, destroys sight by advising, in a case of internal disease, a wholly inappropriate eye-water, because it had suited his own case of external inflammation.

The dictates of good sense would really seem to be forgotten where the eye is in question: for surely, if there be any faculty of the body of pre-eminent importance and value, it is the faculty of seeing; and, if there be any organ whose delicate and intricate structure demands the most patient and intelligent study and finished skill for its proper comprehension and successful management, it is the organ of vision. Yet this seems to be a lesson which the community is most unwilling to learn; and multitudes of eyes, too valuable to be thus thrown away, are sacrificed to ignorance and neglect.

DISEASES OF THE EYELIDS.

The edges of the lids are often thickened and crusted, and the eyelashes fall out, in

consequence of neglected disease of the roots of the lashes, and the lubricating glands which open near them.

If left to themselves, the lids grow more and more unsightly, the bulbs which form the eyelashes are at last destroyed, and no new growth is produced, the margin of the lid being left bare and rounded. Yet the healthy condition may be easily restored and preserved by a little care and the seasonable use of proper applications. The crusts should not be allowed to remain upon the edge of the lids, and give rise to ulceration, but should be softened with warm water, and removed without violence.

After the thickening has continued a long time, the parts are not at once restored to a normal state; and the mild remedies prescribed by the physician must be patiently continued, and should even be used occasionally after the disease has been subdued, to give a healthy tone to the parts, and prevent any re-appearance of the symptoms.

Rounded tumors are sometimes slowly formed in the lid, at a distance from its margin, which are seldom dispersed by local applications, but require a slight surgical operation for their removal. They should not be allowed to become very large.

Erysipelatous inflammation of the lids causes much swelling and redness; and an abscess sometimes results. Should this occur, it should be opened as soon as possible, otherwise the skin of the lid is extensively undermined by the matter which spreads beneath it. But this should be done with great care, lest the eyeball itself should be injured.

The swelling of the lids which accompanies inflammation of the tear-sac resembles that caused by erysipelas, and is often mistaken for the latter when it is so great as to close the eyes; but it may be distinguished from erysipelatous disease by the greater hardness and tenderness near the nose, over the region of the sac.

OBSTRUCTIONS OF THE TEAR-PASSAGES.

Great suffering results from want of attention to the early symptoms of obstruction to the proper flow of the discharges from the eye. The lining of the tear-passages is often, at first, merely thickened, and its healthy state may be easily restored; but, if neglected, the lachrymal sac, the reservoir placed in the side of the nose to receive the secretions from the eye, acquires a condition of chronic inflammation; and the passage leading downward from it becomes more or less completely closed, perhaps requiring tedious and painful treatment for its restoration. When in this condition, a slight exposure may cause inflammation of the sac, with great pain and swelling of the surrounding parts, often mistaken for erysipelas. Matter rapidly forms; and, if the sac is not promptly relieved, it bursts, and the pus spreads beneath the skin, and at last finds its way to the surface, forming a fistula lachrymalis, which is annoying, and difficult to heal.

. Formerly, leaden or other styles, or gold or silver tubes, were inserted into the sac and the duct leading thence to the nose, and were worn for a long time; but this unsightly and often ineffectual means has given place to milder and more successful methods of dilatation. Prevention, however, easily accomplished, at first, by the use of the mildest remedies, is better than the cure of these obstructions.

STRABISMUS.

Strabismus, or squinting as it is often termed, is a deviation of the eyes from their proper direction in looking at objects. Its most common form, where one or both eyes turn towards the nose, is, as I have already shown, associated with hyperopia in a large proportion of cases. As it usually shows itself about the time when a child begins to look carefully at objects, and is especially likely to occur if the child is enfeebled by illness, its origin is often attributed to an at-

tack of whooping-cough, measles, or other disease.

It is a great mistake to allow this abnormal turning of the eyes to continue unrelieved for years, as is too often the case. Especially is this true where the squint seems to affect one eye only; for the eye which habitually deviates does not receive images of objects which harmonize with those in the other eye, and, after a time, disregards the impressions made upon it, and gradually loses its perceptive power. It is common for parents to wait, first "to see if the eyes will not come right," and afterwards "to let the child decide, when old enough," whether he wishes to have the deformity relieved. This would be a very proper course if it were *merely* a question of appearances, and the sight did not also become involved by delay.

If the other eye be covered, it will often be found that the child sees less well with the squinting eye: and this loss of acuteness of vision increases and becomes confirmed

with time; so that, though an operation done at a later period may remove the deformity, it cannot restore the diminished visual power.

At first, the disposition to turn in is perhaps noticed only when the child is fatigued, excited, or ill; but if this becomes, after a few months, more and more constant, it is best not to defer treatment. This does not, however, necessarily involve an operation; for the disposition to squint may often be controlled by suitable glasses, which take away the necessity for the excessive calling into action of the internal recti muscles. But, if an operation is required, there is no excuse for postponing it, in these days of etherization, from a reluctance to subject the child to pain.

When the squint is considerable, it is often necessary to divide the muscle which is affected, in both eyes, in order to insure a perfect result; the deformity and the defective optical conditions being only partially relieved by an operation on one eye only. Af-

ter operation, it is often essential that convex glasses should be worn, at least for study and fine work.

The opposite deviation, where the eye turns outward, is most frequently a consequence of near-sightedness, resulting, in many instances, from alteration of the shape of the posterior part of the eyeball, rendering its motions less free in the socket. This diseased condition makes it more difficult to remove the deformity by operative means than in convergent strabismus; and the condition of the interior of the eye should be carefully examined to ascertain if progressive and dangerous myopic changes are in progress.

Temporary or permanent strabismus may also occur where the nerves which supply the motor muscles of the eyeball are paralyzed from the action of external causes, or from disease of the brain. The cure in these cases must depend on the removal, if possible, of the original paralyzing influence.

DISEASES OF THE CONJUNCTIVA.

Some of the affections of the conjunctiva, the mucous membrane covering the front of the eyeball and lining the lids, are among the most fatal to vision; and their frequency, and oftentimes their severity, their tendency to linger, and the danger of their being communicated from one individual to another, give them an important place among the diseases of the eye.

INFLAMMATION IN NEW-BORN CHILDREN.

Within a few days after birth, the lids of one or both eyes sometimes become red and swollen, and a creamy matter begins to form. Except where the affection is slight, the symptoms rapidly increase; the lids swell so much as to project beyond the eyebrows, and completely close the eyes; the discharge of matter becomes so copious, that it pours out in great quantity if the lids are separated; and the eyeball itself becomes involved.

If the disease is not checked, the transparent front of the eye, the cornea, is liable to more or less complete destruction from ulceration. This may take place suddenly, from the extreme severity of the inflammation; or it may occur only after the symptoms have already diminished, — the cornea holding out for a time, but at last yielding to the effects of the inflammation of the surrounding parts, and the constant flowing over it of the abundant and irritating discharges.

The liability to ulceration of the cornea renders this disease a source of great anxiety to even those of most experience; yet it is common to see the management of these cases undertaken by nurses or friends whose little knowledge is worse than ignorance, and who waste precious time in trying worthless means, until it is discovered, too late, that fatal injury has been done to vision.

Cleanliness is of the first importance in these cases, not only for the safe recovery of the eyes affected, but to lessen the danger

of contagion. Many an eye has been lost in consequence of being touched with a finger or a towel or handkerchief which had been in contact with matter from the eye of the babe. The discharge must not be allowed to remain in the eye, but should be thoroughly washed out every hour or half-hour, if necessary, by means of a small syringe, introduced under the swollen upper lid, so as to completely cleanse the eye from the accumulated secretions. Applications to the outside of the lids, such as poultices, &c., should be absolutely abstained from, as they are highly dangerous. It is important that the medical adviser should see the disease in its earliest stages; as its fearful progress may often then be cut short, or its severity mitigated.

INFLAMMATION FROM EXPOSURE TO COLD OR DUST.

The most common affection of the external membranes of the eye results from the action of cold or dust, or some similar source of irri-

tation. It may also extend through a family or neighborhood, where the same towels or wash-basins which have been used by an individual having sore eyes are made to serve for other persons.

The pain complained of is a smarting or itching, as if sand or sticks were in the eye; and matter is discharged in greater or less amount, frequently causing adhesion of the lids together during the night.

The disease is often easily relieved at the outset by suitable remedies; but if these are neglected, or if inert or too harsh measures are resorted to, the symptoms are aggravated or indefinitely prolonged, the disease having little tendency to spontaneous cure. Examples are constantly seen of the melancholy results of inattention and mismanagement. Working-men are unwilling to lose time in attending to their eyes during the early period; and when, at last, they seek advice because they are unable to work any longer, the slight changes of structure at the beginning

have become so great, that months instead of days are required for the restoration of the healthy condition. When not absolutely neglected, the eyes are often tampered with, and with ruinous results. The catalogue of substances in popular repute as sure means of relief would be almost endless. Of these, a few would be useful if employed in cases to which they were suited; but most of them are worthless, and many injurious.

INFLAMMATION FROM CONTAGION.

Rapidly fatal ulceration of the cornea may ensue upon inflammation of the conjunctiva following the introduction of a minute particle of contagious matter; eyes being sometimes thus totally lost in from twenty-four to forty-eight hours. Immediate and skilful treatment is imperative if the eye is to be saved. Great care should be taken to preserve the other eye, as well as those of any persons who may be exposed, from inoculation with the virulent discharge by a careless

touch with the fingers or with any thing which may have been infected by it.

GRANULATIONS OF THE EYELIDS.

After long-continued inflammation, and frequently without this, the inner surface of the upper lid may become rough from the formation of what are termed granulations. Sometimes these are almost cartilaginous in their hardness; and their constant friction upon the cornea a thousand times a day, every time the eye rolls or the lids wink, leads to dangerous alterations of its condition. The cornea loses its smoothness and transparency; blood-vessels are developed where none ought to be visible; and at last ulceration and perforation take place, causing more or less implication of internal parts, and injury to vision.

When the front of the eye has become so entirely clouded that the person cannot find his way or do more than perceive light, great patience and confidence are required on the

part both of the sufferer and his physician. Speedy removal of the morbid changes is wholly impossible: until the roughness of the eyelids has been greatly lessened, the cloudiness of the cornea can be but little diminished; for, the cause continuing to act, the effect remains. It is hard for a person and his friends to believe that he is improving, and is even nearly well, when he cannot perceive that he sees much, if at all, better. Yet this may be the case; it being only when the granulations have been almost removed that the cornea recovers from the effects of their friction, and its clearness is gradually restored. Therefore the sufferer should take courage if his eyelids are made more comfortable, and the discharge from them grows less; and treatment should be hopefully continued till the amelioration of some of the conditions prepares the way for an evident improvement of his sight. No advantage is obtained from frequent changes of remedies in the hope of a more rapid gain.

It is important that the granulations should be *entirely* removed. Those who have been blind for months or years are too often so rejoiced at the recovery of sight and of a comfortable state of the eyes, that they disregard the lingering of some remains of disease beneath their lids which may be roused by slight causes to renewed activity. They are anxious to return to their occupations, and hope their eyes will go on in their course of improvement. It is unsafe, however, to indulge this hope prematurely; and treatment should not be abandoned till all parts of the lining of the lid have been brought to so healthy a state, that the inconveniences and dangers of a relapse are no longer to be feared.

ULCERATIONS OF THE CORNEA IN CHILDREN.

Ulcers of the cornea, most frequently near its centre, are very common in young children. They are attended with intolerance of light, sometimes so extreme, that the child

gives up all his usual pleasures, and even his food, to keep the lids day after day spasmodically closed, and the head buried in cushions or pillows. In other cases, the eyes can be opened in the afternoon or evening; though they shrink from the morning light. Children often become restless and peevish; the whole disposition being changed during the continuance of the disease. These cases differ greatly in their duration, and, if neglected, may be prolonged for months, till the health suffers from want of air and exercise.

It is usually possible, by engaging the child's attention, to obtain a look at the eye in a moderate light, so as to ascertain the extent of the ulceration, without resorting to forcible opening of the lids.

Even when superficial, these ulcers usually leave behind them a temporary cloudiness of the cornea; and, if they penetrate deeply, they cause a permanent opacity, which, though it may lessen in extent and density, does not wholly disappear, but affects vision

in a greater or less degree. It is, therefore, very desirable that the ulcerative process should be arrested as soon as possible, to shorten the term of suffering, and avert the injury to sight.

Solutions of sugar of lead, a favorite popular remedy, should be avoided with especial care in all diseases of the eyes in children; since, where ulceration exists, the lead solution is decomposed, and forms an indelible white deposit upon the ulcerated surface. Laxative medicines or blisters, so often used as domestic prescriptions in the hope of clearing the system of "humors," are also objectionable; the child more often needing tonics and good diet than any debilitating treatment.

Small pimples, of which there may be one or several at or near the edge of the cornea, upon the white of the eye, must not be mistaken for the ulcerations above referred to. They are of comparatively trivial importance, and can be disposed of in a few days by the

use of mild lotions, which are better than more severe treatment.

INFLAMMATIONS OF INTERNAL PARTS OF THE EYE.

A brief reference to a few points will show how suicidal is the course often pursued in neglecting disease of the important internal structures of the eye until their vitality is wholly destroyed, and recovery of vision hopeless.

Some of the most serious of these changes are attended with little pain, and perhaps give warning of their progress only by diminished sight. When pain occurs, as in the cases of acute inflammation, it differs from the smarting or itching sensations accompanying most of the forms of external inflammation, and has a deep-seated aching character, often extending along the nerves in the neighborhood of the eye, and sometimes more severe in the forehead and temples than in the eye itself. Any such pain, there-

fore, especially if accompanied by dimness of sight, should receive immediate attention as a warning of impending mischief.

As might be supposed, most of the remedies which prove useful in the treatment of inflammations of the external membranes of the eye are not at all adapted to affections of the internal parts, and can only be hurtful if applied.

INFLAMMATION OF THE IRIS.

This curtain, stretched across the interior of the eye, and from which it takes its color, — blue, hazel, &c., — is frequently the seat of inflammation. Generally this is attended with pain, extending to the brow, or even to the whole of that side of the head, and usually more severe at night. The eye is often quite red, especially around the cornea; but, in some cases, there is little to attract attention to the eye. There is usually a copious flow of tears, but little thick mucous discharge.

The source of danger lies especially in the tendency to closure of the pupil by adhesion of its edges to neighboring parts. The thickened iris lies in contact with the crystalline lens; and the lymph thrown out from it, similar to the material which unites the edges of ordinary flesh-wounds, forms deposits which cement the margin of the pupil to the lens behind it, and often completely fill its area. This misfortune may be avoided by timely treatment, the iris and lens being kept from contact with each other till the inflammation subsides. This is of great importance to the actual and prospective safety of the eye. If adhesions have already formed, they may sometimes be detached, while still recent, by the use of remedies; but, if neglected, they become firmly fastened, and can only be separated by surgical means.

Even slight adhesions increase the danger in case of future attacks of the disease; but, where the pupil has become entirely closed, immediate surgical interference is necessary

to prevent a slow, destructive process resulting from pressure of the accumulating fluids behind the iris, which can no longer find their way through the pupil.

Strong light and much use of the eyes should be avoided during the attack.

Persons of rheumatic constitution are liable to repeated visitations of iritis, which may occur at longer or shorter intervals. They should be careful to give prompt attention to the earliest symptoms, — slight pain or dimness, or soreness on moving the eyeball, — as a prolonged attack may often be averted if the eye is at once placed under the influence of suitable remedies.

GLAUCOMA.

One of the diseases most absolutely fatal to vision if neglected, or if inefficiently treated, is glaucoma. It is most frequent in women; usually occurs after the middle period of life; and often follows physical or mental depression resulting from fatigue in

watching with sick friends, or grief in mourning their loss.

The pain in acute attacks is agonizing: but it is often felt so much more severely in the nerves in the vicinity of the eye than in the globe itself, that these symptoms are frequently mistaken for facial neuralgia; and, notwithstanding the loss of sight, the primary seat of the disease is overlooked. The eyeball becomes hard; the cornea loses its sensibility, so that it may be touched with a probe without causing pain; the iris is pushed forward and the pupil dilated by the overcrowding of parts behind it; and all vision, even the perception of light, may be lost within a few days. There is often very little redness of the eyeball. These symptoms now and then subside for a time, to return after a longer or shorter interval with renewed force.

The attack is often preceded by a necessity for rapidly increasing the strength of the glasses worn for reading, and by an appear-

ance of rainbow-colors around the light on looking at a lamp in the evening, or of a fog or white sheet thrown over objects in the daytime.

On examination with the ophthalmoscope, the entrance of the optic nerve, if still visible, shows a cup-like depression, — a result of the extreme pressure within the globe. As the disease goes on, the transparent internal parts grow cloudy, so that the optic nerve can no longer be seen; the globe becomes of a stony hardness; the pupil is enlarged to the utmost; the iris is thinned by pressure; the lens is crowded forward until it lies against the cornea and takes a sea-green color; and hopeless disorganization ensues in all the tissues. The pain may continue during all these changes, or it may subside at an earlier period.

The only known remedy for this disease is the early performance of what is termed iridectomy — an excision of a portion of the iris — before the morbid changes have con-

tinued long enough to crush out the visual power, and spoil the eye by their fatal pressure.

The results of this operation, the greatest triumph of modern ophthalmic surgery, seem almost miraculous. It at the same time removes the extreme tension, and puts an end to the unhealthy action which gave rise to it; and a sufferer, one or both of whose eyes had become blind, obtains instant relief from the intense pain, and regains more or less quickly his lost vision. But, to be complete, the relief must be speedy: too long compression of the delicate tissue of the retina destroys its powers.

AMAUROSIS.

Prior to the invention of the ophthalmoscope, the term "amaurosis" was applied to loss of sight arising from sundry obscure conditions of the deeper-seated parts of the eye. Most of these are now distinguished as resulting from various changes, and are des-

ignated according to the structures affected; and, as now understood, amaurosis implies disease in or behind the optic nerve, excluding such loss of sight as results from inflammation of the choroid or retina, separation of the retina, &c. Many cases, formerly considered hopeless amaurotic disease, are now found by the ophthalmoscope to belong to a more hopeful class of affections, capable of relief.

DISEASES OF OTHER ORGANS MANIFESTED IN THE EYE.

Not the least among the wonders revealed by the ophthalmoscope is the detection of diseases of other and distant organs by an examination of the internal parts of the eye. This has become possible; and the appearances indicating degeneration of the kidney can be as positively distinguished from those denoting certain changes in the brain, or from the structural alterations caused by diseases originating in the eye itself, as any of

the most evident external manifestations of disease — as, for instance, those of small-pox and scarlatina — can be discriminated from each other. The knowledge thus obtained will doubtless become more and more available in the explanation of phenomena which have hitherto been obscure, and aid in the successful treatment of disease.

CATARACT.

Cataract consists in a loss of transparency in the crystalline lens or its capsule. Cloudiness of the cornea, the result of ulceration, is quite a different thing; though such opacities are often supposed to be cataract.

When children are born with cataract, or it is developed early in life, as also in cases where it has resulted from a blow or wound of the eye, the cataract is usually soft, and of a whitish or bluish-white color. When caused by a hurt, it is formed only in the injured eye; but, when not the result of an accident, it generally appears sooner or later in both eyes.

Soft cataract may be removed with little risk by an operation; but it is safer, in many instances, to operate by such a method as will require considerable time for the subsequent absorption and disappearance of the opaque lens, rather than to attempt its immediate removal.

The larger number of cataracts are found in persons beyond middle life; the disease affecting those of every condition and occupation, without apparent relation to the amount or nature of the use they may have made of their eyes. It is probably a result of modifications in the nutrition of the lens, causing it to become opaque, just as the hair becomes white in some persons with advancing age. Like these changes in the hair, it is often hereditary.

The progress of the cloudiness, which gradually shuts out perception of objects, varies greatly in different cases. This circumstance, and the fact that the vision may often be temporarily improved by palliatives,

has allowed charlatans to claim that they have cured cataract without operation; but this pretension, often made, is as often falsified by the steady increase of the abnormal changes.

Sometimes the existence of cataract is accidentally discovered upon closing one eye, when it is found that vision in the other is nearly gone. In other instances, a slight confusion of vision attracts attention to the eye in the very early stages of cloudiness.

Persons affected with cataract often see better in a dim light, at twilight, or on cloudy days, and perhaps find themselves suddenly unable to see on going into a bright sunlight. They should therefore be careful, when coming out of church or other places into a broad daylight, not to make mistakes in their judgment of distances, and thus be liable to falls.

It is an error to suppose that there is no help for old people who become blind from cataract. The operation for its extraction

from the eye is generally successful in restoring vision, — far more so than could have been expected, considering the exceeding delicacy of structure of the eye; and it can be done without pain, and usually involves only a brief confinement. Persons who are in their usual health, however aged they may be, whose eyes are not otherwise diseased, may therefore submit to an operation with confidence and hope.

NATURAL AND ARTIFICIAL LIGHT.

Of all the requisites for a comfortable use of the eyes, none is more important than a favorable and sufficient light; and perhaps none is oftener neglected. Many persons read while lying down; giving more thought to comfort in the position of their bodies than to whether the light falls in such a direction as is adapted for easy vision. Many schoolrooms are so arranged as to favor only the teacher, whose desk is between the windows; while a flood of light falls full on the faces of the pupils,

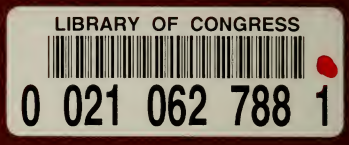
whose eyes have no protection against the strong glare.

Such a position as will allow the light to fall over the shoulder upon the book or paper is best in reading or writing, especially in the evening; the book being also so held that the eyes are not exposed to a direct reflection from the pages.

When artificial light is used, it should be steady and abundant. Far more harm is done by too little than by too much light, when the eyes are used for reading, sewing, and similar avocations; and we may well rejoice in the advent of better means of illumination than were possessed by our ancestors. Tradition tells us that tallow-candles and pitch-pine splinters enlightened the eager youthful studies of some whom our country has ranked high among her honored names; but we are more fortunate in having for our "midnight oil" the German student's-lamp, the bright gas-jet, or the clear flame of kerosene.

A soft, steady light, such as is given by a

student's or a carcel lamp, is perhaps the perfection of artificial light; yet we may regard gas or kerosene as good enough for all practical purposes, if used in sufficient quantity, and with burners which do not flicker.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